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Health Games, Simulations, and Technology: Wave of the Future for Learning

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The majority of individuals entering today's workforce have grown up playing computer games and using a variety of communications devices. There is a revolution under way, using gaming practice in medicine with virtual environments, virtual reality, and constructive environments such as disaster response and triage. As the shortage of public health, emergency responders, physicians, and nurses increases within the next decade, the demand for simulation training in virtual environments will also increase. Simulation training provides the means to: 1) more expediently and effectively educate America's future health care workforce and 2) improve patient safety and care.

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Representatives from the Indiana State Department of Health (ISDH) exhibited the Indiana Pandemic Influenza Simulation on May 7-9, 2008, at the Games for Health Conference in Baltimore, Maryland. During this 3-day event, more than 350 attendees participated in over 60 sessions, representing a wide range of health care activities provided by an international array of 75 speakers. Founded in 2004, the Games for Health project supports the community, knowledge, and business development efforts to use cutting-edge games and game technologies to improve health and health care. The Pioneer Portfolio of the Robert Wood Johnson Foundation is the lead conference sponsor and a major supporter of the Games for Health project.

The ISDH recently launched a pandemic influenza simulation course that provides learners the opportunity to expand concepts of public health planning and preparedness critical to protecting public health during an influenza pandemic. The Indiana Pandemic Influenza Simulation is a creative continuing education opportunity included in the

Indiana Learning Management System (LMS) to expand concepts of public health planning and preparedness.

The simulation allows individuals to practically apply decision-making skills for specific responsibilities and roles during an influenza pandemic. Additionally, learners who are not public health professionals experience a glimpse of public health and may possibly consider a career in that profession. In addition, the simulation helps improve response skills needed to more effectively respond during a full-scale exercise, drill, or actual public health emergency. This Web-based simulation allows users to select from 10 functional roles: public health professional, public information officer, mental health professional, emergency management agency staff, medical/hospital preparedness staff, point of distribution, mental health, screener, security, and supervisory staff. The simulation drill also includes three mock scenarios that allow individuals to use their knowledge and decisions within their roles during a simulated influenza pandemic. The simulation can be accessed on the LMS at www.inlms.com.

The goals of exhibiting the simulation training were to promote the use of the simulation and the LMS in other states and internationally and to demonstrate a cost-effective, online accessible training tool.

Over 70 conference participants visited the ISDH booth; 35 of them received a personalized, intensive tour through the simulation. Affiliations of those who viewed the simulation training included the *New England Journal of Medicine*, Princeton University, Information in Place, Serious Games Blog, SimQuest, Federation of American Scientists, PIP Vyro Games, and University of Maryland. Although most of the simulation booth visitors included contacts from American companies, representatives from England, Ireland, and Brazil also viewed the simulation.

Highlights of the conference included:

1. The importance of bridging game developers, scientists, and research regarding communication and funding; maintaining, revising, and expanding current simulation tools.

2. The shortage of health care providers within the next decade will necessitate simulation training in virtual environments to expediently prepare future providers and improve patient safety and care.

3. Terminology in the gaming community is extensive and requires a clear understanding to ensure effective communication with funding representatives and those seeking to use gaming technology.

4. There are no clear measures, or standards, to measure games for effectiveness, standard platforms for consistency, and very limited collaboration.

Nocardia Surveillance Under Way

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The Indiana State Department of Health (ISDH), in partnership with the Centers for Disease Control and Prevention (CDC), is conducting surveillance of *Nocardia* infections. *Nocardia* bacteria are gram-positive, weakly acid-fast, gram-positive, and ubiquitous in the environment. These bacteria cause opportunistic infections, including respiratory infections, abscesses, skin infections, and tumors. Risk factors for nocardiosis include being a transplant recipient, steroid use, advanced HIV disease, malignancy, chronic pulmonary disease, or intravenous drug abuse.

Historically, sulfonamides were the treatment of choice, but sulfonamide resistance has been reported in Europe, Japan, and the U.S. Approximately 500-1,000 new cases of nocardiosis occur annually in the United States. Overall, 80 percent of cases present as invasive pulmonary infection, disseminated disease, or brain abscess; 20 percent present as cellulitis. Although incidence data are extremely limited, the number of nocardiosis cases probably has increased recently due to the overall increased number of severely immunocompromised persons. Currently, there is no national reportable surveillance system for nocardiosis.

From January 2000-December 2004, 72 *Nocardia* isolates obtained from Alabama residents with culture-confirmed nocardiosis were submitted to CDC for antimicrobial susceptibility testing at the request of the attending health care providers. The CDC determined the species and evaluated the antimicrobial susceptibility patterns of all isolates. The most common species identified (44%) was *Nocardia nova*. Forty-nine (68%) of 72 isolates were resistant to sulfonamides, the highest resistance rate ever recorded in the U.S. These data demonstrate the importance of performing species identification and antimicrobial susceptibility testing for *Nocardia* and suggest that further monitoring is needed to determine the burden of nocardiosis caused by antimicrobial-resistant *Nocardia* and to determine the relationship between resistance, treatment, and patient outcome.

To determine the true rate of antimicrobial resistance, the CDC is conducting short-term surveillance for resistance that would ideally capture all *Nocardia* isolates in a state and determine the timing of the course of disease and treatment, the species, and the resistance patterns. Knowledge of the incidence of naturally occurring, initial resistance in *Nocardia* isolates will facilitate appropriate public health response, whether in the form of investigation, recommendation, or further evaluation.

For this three-year project, the CDC has implemented laboratory-based surveillance for nocardiosis by evaluating *Nocardia* isolates collected in various states, including Indiana. *Nocardia* isolates are submitted to CDC, consistent with ongoing practices for routine reference laboratory support.

To support the appropriate interpretation of laboratory results, CDC requests information on recent use of antimicrobials and results of previous laboratory testing for each isolate. Information is requested on the date of initial diagnosis, antimicrobial therapy, date of specimen collection, outcome of the infection, and previous laboratory results. These data will allow the CDC to: 1) determine if the apparent increase in resistance represents a true increase in resistance or if it is an artifact; 2) describe the percent of newly diagnosed *Nocardia* infections that are antimicrobial resistant, 3) share data with local health care providers and public health entities for use in antimicrobial therapy planning, and 4) evaluate the usefulness and sustainability of the elements of the three years of *Nocardia* surveillance to determine viable ongoing surveillance efforts. Subsequent years of this project will examine in-depth the laboratory and epidemiologic information associated with cases of nocardiosis.

E^3 Easy Epidemiology for Everyone

E^3 is a new feature of the Indiana Epidemiology Newsletter dedicated to exploring the fundamentals of epidemiology. Each month, a different epidemiology concept will be explored to enhance understanding of basic epidemiology.

What Is a P-Value?

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The last couple of newsletters described case control and cohort studies. The next step is looking behind the studies at the p-value and confidence interval. This month focuses on the p-value.

You might ask about the p-value when discussing which variables or exposures are significant in a study or outbreak investigation. In public health, the p-value, or probability value, is used to determine if the observed differences between groups (such as ill and not ill) are true differences. Epidemiologists are taught to look at the p-value when evaluating significance and testing hypotheses. Although the significance level is arbitrary, a p-value of less than or equal to 5 percent (0.05) is widely accepted. Smaller or larger percentages may be used if justification, such as previous studies or clinical significance, is warranted. For the purpose of this article, a p-value of ≤ 0.05 will be considered statistically significant, as most public health professionals use this value as a standard.

The p-value indicates how often you would expect to see the observed outcomes just as a result of chance. P-values less than or equal to 5 percent are considered "statistically

significant", which means the result is not likely attributable to chance. Events that have a high probability of occurring ($p > 0.05$) are considered more common and, therefore, not significant. P-values range from 0-1 and are usually expressed as $p < 0.05$.

P-value Example

This example will assist in understanding how to interpret a p-value. The table contains hypothetical data on Disease X rates for 2007 per 100,000 people in Indiana by county. The far right column displays the p-value for the disease rate for each county compared to the disease rate for the state. A p-value of less than 0.05 indicates a statistically significant difference between the annual disease rate for the county compared to the state rate.

Location	Rate per 100,000 People	95% Confidence Interval	P-value
State	4.4	4.2 – 4.5	
County 1	5.3	5.1 – 5.6	<0.05
County 2	4.7	4.3 – 5.0	0.28
County 3	8.1	7.7 – 8.3	<0.05
County 4	1.9	1.7 – 2.3	<0.05
County 5	7.7	7.3 – 8.1	<0.05
County 6	4.6	4.0 – 4.8	0.15

As the table shows, four counties have p-values less than 0.05. County 1, County 3, and County 5 have rates that are significantly higher than the state rate. County 4 has a rate that is significantly lower than the state rate. County 2 and County 6 do not have statistically significant p-values, $p = 0.28$ and $p = 0.15$ respectively. Therefore, the rates for County 2 and County 6 are not statistically significantly different than the state rate.

The p-value does have limitations. A non-significant p-value does not necessarily mean the outcome is not clinically important. Similarly, there is a possibility that an outcome can be statistically significant and not be practical. The "common sense" component of public health practice is an essential part of decision-making and should not be limited by a p-value. To further explain this limitation, consider two studies. The first study looks at a low-fat diet and breast cancer in women with prior breast cancer. The second study looks at a low-fat diet and breast cancer in women without prior breast cancer. The p-value in the first study was significant ($p = 0.03$) and the p-value in the second study was not significant ($p = 0.07$). However, in both studies, the low-fat diet groups developed fewer new breast cancers. Although the second study was not significant, the result of fewer new breast cancers was clinically significant.

Another limitation of the p-value is that the value can be influenced by the number of subjects. If there are too few people in the study groups, the p-value may be unstable. There is no way to distinguish when no difference exists between groups (no significance) and when there are not enough people in the study groups.

The p-value is important but should not be the sole determination of significance. A better assessment would also include appropriate confidence intervals (along with an odds ratio or risk ratio), which will be discussed in the next issue of the *Indiana Epidemiology Newsletter*.

References

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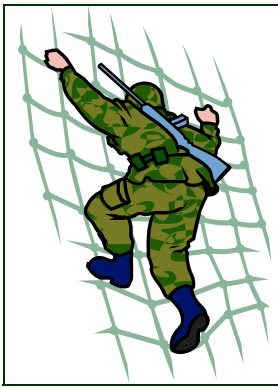
3. Chlebowski RT, Blackburn GL, Thomson CA, et al. Dietary fat reduction and breast cancer outcome: interim efficacy results from the Women's Intervention Nutrition Study (WINS). *J Natl Cancer Inst.* 2006; Vol. 98, No. 24, pp 1767-1776.



Training Room

INDIANA STATE DEPARTMENT OF HEALTH IMMUNIZATION PROGRAM PRESENTS:

Immunizations from A to Z

Immunization Health Educators offer this FREE, one-day educational course that includes:

- Principles of Vaccination
- Childhood and Adolescent Vaccine-Preventable Diseases
- Adult Immunizations
    - Pandemic Influenza
- General Recommendations on Immunization
    - Timing and Spacing
    - Indiana Immunization Requirements
    - Administration Recommendations
    - Contraindications and Precautions to Vaccination
- Safe and Effective Vaccine Administration
- Vaccine Storage and Handling
- Vaccine Misconceptions
- Reliable Resources

This course is designed for all immunization providers and staff. Training manual, materials, and certificate of attendance are provided to all attendees. Please see the Training Calendar for presentations throughout Indiana. Registration is required. To attend, schedule/host a course in your area or for more information, please reference **http://www.IN.gov/isdh/programs/immunization.htm.**

ISDH Data Reports Available

The following data reports and the *Indiana Epidemiology Newsletter* are available on the ISDH Web Page:

http://www.IN.gov/isdh/dataandstats/data_and_statistics.htm

HIV/STD Quarterly Reports (1998-June 2006)	Indiana Mortality Report (1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006)
Indiana Cancer Incidence Report (1990, 1995, 1996, 1997, 1998)	Indiana Infant Mortality Report (1999, 2002, 1990-2003)
Indiana Cancer Mortality Report (1990-1994, 1992-1996)	Indiana Natality Report (1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006)
Combined Cancer Mortality and Incidence in Indiana Report (1999, 2000, 2001, 2002, 2003, 2004)	Indiana Induced Termination of Pregnancy Report (1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005)
Indiana Health Behavior Risk Factors (1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006)	Indiana Marriage Report (1995, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004)
Indiana Health Behavior Risk Factors (BRFSS) Newsletter (9/2003, 10/2003, 6/2004, 9/2004, 4/2005, 7/2005, 12/2005, 1/2006, 8/2006, 10/2006, 5/2007, 12/2007)	Indiana Infectious Disease Report (1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005)
Indiana Hospital Consumer Guide (1996)	Indiana Maternal & Child Health Outcomes & Performance Measures (1990-1999, 1991-2000, 1992-2001, 1993-2002, 1994-2003, 1995-2004, 1996-2005)
Public Hospital Discharge Data (1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006)	Assessment of Statewide Health Needs – 2007

HIV Disease Summary

Information as of July 31, 2008 **(based on 2000 population of 6,080,485)**

HIV - without AIDS to date:

359	New HIV cases from August 2007 thru July, 31 2008	12-month incidence	6.24 cases/100,000
3,808	Total HIV-positive, alive and without AIDS on July 31, 2008	Point prevalence	66.20 cases/100,000

AIDS cases to date:

390	New AIDS cases from August 2007 thru July, 31 2008	12-month incidence	6.78 cases/100,000
4,118	Total AIDS cases, alive on July 31, 2008	Point prevalence	71.59 cases/100,000
8,721	Total AIDS cases, cumulative (alive and dead) on July 31, 2008		

REPORTED CASES of selected notifiable diseases

Disease	Cases Reported in July *MMWR* Weeks 27-30		Cumulative Cases Reported January – July *MMWR* Weeks 1-30	
	2007	2008	2007	2008
Aseptic Meningitis	21	22	103	107
Campylobacteriosis	56	121	244	342
Chlamydia	1,203	1,170	11,961	11,516
Cryptococcus	1	0	13	14
Cryptosporidiosis	3	26	29	95
E. coli, shiga toxin-producing	13	19	30	35
Haemophilus influenzae, invasive	1	7	32	52
Hemolytic Uremic Syndrome (HUS)	0	0	0	1
Hepatitis A	0	4	4	12
Hepatitis B	6	5	26	24
Histoplasmosis	6	7	57	44
Influenza Deaths (all ages)	Not Reportable	0	Not Reportable	15
Gonorrhea	537	465	5,011	4,660
Legionellosis	10	5	25	25
Listeriosis	1	1	7	3
Lyme Disease	4	6	17	13
Measles	0	0	0	0
Meningococcal, invasive	2	1	15	17
Mumps	0	0	1	0
Pertussis	14	6	40	28
Rocky Mountain Spotted Fever	1	1	4	2
Salmonellosis	81	136	326	323
Shigellosis	8	83	37	448

REPORTED CASES of selected notifiable diseases (cont.)

Disease	Cases Reported in July *MMWR* Weeks 27-30		Cumulative Cases Reported January – July *MMWR* Weeks 1-30	
	2007	2008	2007	2008
Group A Streptococcus, invasive	14	12	83	99
Group B Streptococcus, Newborn	3	2	18	15
Group B, Streptococcus, invasive	32	34	133	172
Streptococcus pneumoniae (invasive, all ages)	21	38	370	567
Streptococcus pneumoniae (invasive, drug resistant)	6	8	112	156
Streptococcus pneumoniae (invasive, <5 years of age)	3	4	26	45
Syphilis (Primary and Secondary)	3	9	24	77
Tuberculosis	9	18	75	74
Yersiniosis	4	0	10	5
Animal Rabies	0 (bat)	2	6 (bats)	3 (bats)

For information on reporting of communicable diseases in Indiana, call the *Surveillance and Investigation Division* at 317.233.7125.

Indiana State Department of Health
Epidemiology Resource Center
2 North Meridian Street, 5-K
Indianapolis, IN 46204
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Cover photo of Cryo-EM reconstruction of a norovirus capsid.courtesy of Dr. B.V.V. Prasad, Baylor College of Medicine, Houston, TX 77030

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